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International Decade for Natural Disaster Reduction

Report of the Secretary-General

Addendum

Final report of the Scientific and Technical Committee of the International Decade for Natural Disaster Reduction

Summary

The present report conveys the views of the Scientific and Technical Committee of the International Decade for Natural Disaster Reduction to the Secretary-General of the United Nations. The Committee assesses progress during the Decade, and provides concluding observations about future needs as well as recommendations for arrangements to ensure continued international commitment for disaster prevention into the twenty-first century. The report first provides a summary review of salient developments in primary areas of disaster reduction. It highlights how scientific knowledge and technical experience can best be utilized in conjunction with public policies to minimize social disruption and economic loss from natural and similar disasters which have an adverse effect on the environment. However, the pace of implementation must be enhanced, as the subject becomes embedded in more professional disciplines and intersectoral forms of endeavour. The need is urgent as the costs of disaster consequences to societies around the world

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continue to rise, and as conditions of natural hazards are likely to produce more frequent and severe risks for the future. The need for sustained commitment to disaster prevention is universal and of importance to all societies, but the greatest impacts of natural hazards continue to fall on developing countries, countries in transition and the poor, wherever they may live. The report concludes that remarkable progress has been made in the acceptance of the desirability and feasibility of prevention policies, and numerous activities promote multidisciplinary commitments to effective disaster reduction.

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I. Introduction

1. The Member States of the United Nations proclaimed the International Decade for Natural Disaster Reduction (IDNDR) in General Assembly resolution 44/236 of 22 December 1989, on the basis of the report of the International Ad Hoc Group of Experts on IDNDR (A/44/322–E/1989/114/Add.1, annex). It has had the objective of reducing through concerted international action, especially in developing countries, loss of life, property damage and social and economic disruption caused by natural hazards, including earthquakes, tropical cyclones and other storms, tsunamis, floods, landslides, volcanic activity, wildfires, locust and similar infestations, drought and desertification, and other calamities of natural origin.

2. In the same resolution, the General Assembly established the International Framework of Action for IDNDR (General Assembly resolution 44/236, annex) which called upon all Governments to assume the primary responsibility to formulate national disaster mitigation programmes and other policies which would reduce the consequences of natural disasters. In addition, scientific and technological institutions, financial bodies, insurance enterprises, non-governmental and other appropriate organizations, as well as all organizations and bodies of the United Nations system, were urged to accord priority to natural disaster preparedness, prevention, relief and short-term recovery throughout their operational activities.

3. The Framework stated several explicit goals that this broad range of collaborators should strive to accomplish during the Decade: build national capabilities to mitigate the effects of natural disasters; develop guidelines and strategies for applying existing knowledge; foster research to close gaps in knowledge; disseminate information; and develop measures to apply technical assistance and technology transfer, demonstration projects, and education and training. Later, programme targets were declared by the IDNDR Scientific and Technical Committee to encourage all countries to conduct a national hazard risk assessment; incorporate a sustained disaster mitigation strategy into the national economic development plan; and ensure improved access to effective early warning practices at all levels of responsibility.

4. In the broad context of international development issues, Agenda 21[1] emphasized that sustainable economic growth and development cannot be achieved without taking measures to reduce losses from natural disasters, further considering the close linkages between disaster losses and environmental degradation. In a similar context, the Rio Declaration on Environment and Development,[2] in particular principle 18, stressed the need for the international community to assist States afflicted by natural disasters and other emergencies that are likely to produce sudden harmful effects in the environment of those States. The outcome of the Global Conference on the Sustainable Development of Small Island Developing States[3] and the Programme of Action for the Least Developed Countries for the 1990s (A/CONF.147/MISC.9) called for priority attention to be given by activities of the Decade to small island developing States and least developed countries. The IDNDR secretariat was designated by the General Assembly in its resolution 51/185 to serve as the task manager to small island developing States related to disaster prevention in reporting to the Commission on Sustainable Development.

5. The mid-term evaluation of the Decade conducted at the World Conference on Natural Disaster Reduction (Yokohama, 23–27 May 1994) noted that although not a part of the mandate of the Decade, the concept of disaster reduction should be enlarged to cover natural and other disaster situations, including environmental and technological disasters, and their relationship, which can have a significant impact on social, economic, cultural and environmental systems, in particular in developing countries (see A/CONF.172/9, chap. I, resolution 1, annex I, sect.I.B).

6. In recognition of the intersectoral and cross-cutting nature of disaster prevention relating to matters of national planning and development, the Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation, containing the Principles, the Strategy and the Plan of Action (A/CONF.179/2, chap. I, resolution 1, annex I), outlined principles and specific recommendations for action at the community and national levels, at the regional and subregional levels, and at the international and bilateral levels of involvement. The same objectives and primary areas of interest promoted by the Yokohama Strategy are emphasized in the IDNDR action plan for 1998/99 to develop greater opportunities for multidisciplinary involvement through inter-agency and organizational partnerships.

7. By drawing on these previous observations and the lessons derived from major disaster occurrences in the later years of the Decade, the Scientific and Technical Committee assesses progress during the Decade in the present report and looks to the future. The report does not provide a comprehensive inventory of IDNDR activities but rather comments on and evaluates the more salient developments during the Decade. These views intend to convey a sense of how best to proceed by incorporating current scientific and technical knowledge into the public policy decision-making

process for the benefit of reducing disaster risks, ultimately at the local community levels. Conditions of increasing social and economic vulnerability will almost certainly lead to unprecedented natural and related hazards in the future, so specific recommendations are made to ensure continued advocacy, the development of policies and the coordination of institutionalized abilities into the twenty-first century. Through continued public awareness and practical application of disaster mitigation techniques, disaster reduction must be understood and realized as a public value.

II. Nature of the threat: natural hazards and contemporary society

8. In almost every country of the world, the consequences of natural hazards seriously affect the quality of life, often potentially thwarting efforts by people to better their lives. In some countries, annual losses associated with natural disasters approach five per cent of gross domestic product in a year, thereby wiping out or substantially reducing the gains sought by investments for economic growth and development. The most disastrous events have killed hundreds of thousands of people and caused over 100 billion dollars in property damage. Throughout the 1990s, the economic losses attributed to great natural catastrophes have averaged more than $40 billion a year. In 1998 alone, natural disasters claimed the lives of more than 50,000 people and caused economic losses exceeding $90 billion. Even more striking, there has been a significant rising trend in these losses during the 1990s, which are almost three times greater than those recorded in the 1980s.[4] Losses of this scale can create economic turmoil and lead to social and possible political instability. As resources become even more tightly managed, all efforts must be employed to reduce the wastage of resources and to protect existing assets and previous investments. Moreover, in part because of short-sighted international trade practices and financial practices and uncontrolled growth, especially in urban areas, a concern has become evident of growing inequities in vulnerability among countries. As a result, the impacts of natural disasters and greater losses often fall most heavily on countries with fragile or transitional economies and people who otherwise lack the resources or technical capabilities to mitigate the risk of natural disasters. This need not remain the case.

9. It has now become evident that the worst effects of natural disasters are frequently linked to human behaviour and settlement patterns, with the result that natural hazards can sometimes trigger subsequent technological disasters. Deforestation easily contributes to increased frequency and severity of floods and landslides. Earthquakes can cause chemical spills and fires, as floods can easily cause contamination by hazardous materials. Recent disasters, such as those related to the El Niño climatic variation in 1997/98, wildfire and associated atmospheric hazards on three continents, and the severe devastation of Hurricane Mitch experienced throughout Central America all further demonstrate the transboundary effects and larger regional consequences associated with natural hazards.

10. Such far-reaching consequences emphasize that natural hazards can no longer be considered as individual, isolated emergency events, to be addressed only in terms of immediate emergency response. Rather, a multidisciplinary and intersectoral approach is essential to anticipate natural, environmental, and technological hazards. It is essential that means to prevent natural disasters draw on scientific and technical knowledge in formulating public policy and decision-making processes. While natural hazards will continue to pose periodic and sometimes recurrent threats to most societies, in many countries a recognition has developed during the course of IDNDR that they need not necessarily become social and economic disasters.

11. Increasingly, many disaster mitigation actions will require difficult choices about the allocation of resources, use of land-use policies, enforcing building practices, and giving priority protection to different types of infrastructure. These decisions, therefore, need to be informed by scientific knowledge and technical experience and included as components of an overall sustainable development decision-making process. Judgements should address equally the environmental considerations involved, as well as sustained programmes of public information and education, including efforts to train and involve future generations.

III. Collaborative endeavour: an emergent community of interests

A. Representative elements of the International Framework

12. A major success of the Decade has been a widespread acceptance of the fact that the growing risk of disasters associated with natural hazards, frequently compounded by uncontrolled or adverse human practices, must be mitigated. The financial costs involved in not doing so simply cannot continue to be absorbed by any society. The feasibility of preventing disasters has become more widely understood and accepted. A recognition has emerged that rather than being

a specialist activity realized only at the time of an immediate threat or a singular event, hazard awareness and risk management responsibilities must be incorporated within ongoing professional activities and local community endeavours evident in all societies.

13. This, however, necessitates including a much wider range of participants than has traditionally been involved in disaster management responsibilities. Abilities essential to the reduction of natural and similar disasters are increasingly being drawn from the public sector, professional and institutional organizations, commercial interests and local forms of community leadership. This growing body of interests is characteristic of extended and distributed networks essential to the work, organizational relationships and forms of communication within modern societies. In physical terms, hazards do not respect political borders, nor in a global economic environment do they remain strictly national affairs. Disaster prevention is inherently multidisciplinary and intersectoral; to become sustainable it must also be transferred to succeeding generations.

14. These necessities for dealing with risk require additional operational partnerships and innovative forms of organizational relationships for the future. They are already becoming embodied in both public and private forms of collaboration, which jointly work through partnership to increase public knowledge and community involvement in disaster reduction activities.

15. In practical terms, reducing the impact of natural hazards depends on several crucial functions, each of which is dependent upon the collaboration of a rapidly expanding range of professional disciplines. Risk assessment is fundamental to a viable programme of disaster reduction, and comprises both the anticipation of likely hazards and an estimation of their potential effects in terms of prevailing vulnerability. The collection and analysis of required information involves many technical experts, but it also depends on other professional skills so that it may be disseminated rapidly and in a manner that is readily understood. Only then can it be utilized effectively by the public and decision makers to inform well considered policies, or to determine the most beneficial interventions.

16. Banking and financial institutions, international technical assistance organizations and the specialized abilities of various United Nations agencies all have a role to play in ensuring that human, technical and material resources are wisely directed to sustained programmes of applied disaster mitigation practices. Established and locally relevant early warning systems are a basic component of any viable disaster reduction strategy, which equally needs to be linked to an operational contingent capability for possible emergency events. Carrying out all of these activities requires cooperation from an expanding range of organizational sectors, currently designated as the IDNDR International Framework. During the Decade, this has included government authorities, technical agencies, many academic disciplines, commercial interests and non-governmental or local community organizations.

B. IDNDR organizational structures

17. In its resolution 44/236, in which it founded IDNDR, the General Assembly established organizational structures to implement the objectives of the Decade. To focus public attention on the issues, the second Wednesday of October was declared to be observed annually by the international community as International Day for Natural Disaster Reduction. Since 1995, this designation has provided the impetus to develop specific themes for international events to advance the objective and goals of the Decade.

18. The IDNDR Scientific and Technical Committee is comprised of 49 international experts (see annex I below) as an advisory body to develop and to make recommendations to the Secretary-General on overall programmes. It has functioned continuously since its formation in 1990 (see annex II below), becoming more diversified in its composition and focused in its deliberations as the Decade has progressed. Since 1997, it has issued declarations following each of its meetings to call international attention to the importance of sustained international and institutional support for disaster reduction, both within and beyond the United Nations.

19. While a Special High-Level Council was also initially constituted in 1991, it was not sustained. Similarly, the original intention outlined for the Department of Public Information of the United Nations Secretariat to have a featured role in raising awareness of disaster prevention among the general public was not significantly realized throughout the Decade.

20. The IDNDR secretariat was established in 1990 to provide support to these organizational bodies, and to undertake the day-to-day coordination of Decade activities. It developed from a basic staffing complement that supported the original Ad Hoc Group of Experts, and it has functioned as effectively as funds permitted during the entire Decade. However, during its earlier years its effectiveness was sometimes constrained by uncertain staffing considerations, as well as by later shifts in emphasis within the international development community that tended to

focus predominantly on matters of emergency relief assistance and related operational aspects of complex disasters, often at the expense of longer-term prevention strategies. Overall, however, the secretariat performed very well over the course of the Decade, probably serving as the single most important factor in sustaining the Decade despite the limited resources available.

21. As an official United Nations conference, the World Conference on Natural Disaster Reduction (Yokohama, Japan, 23–27 May 1994) became a watershed event of the Decade. In addition to serving as the occasion of the favourable mid-term review of the Decade, the primary outcome of the meeting was the Yokohama Strategy and Plan of Action. This operational blueprint continues to provide guidance to all members of the International Framework, as it calls upon nations, working individually and together, to implement policies and principles for disaster reduction that were reaffirmed by the 155 national delegations present.

IV. Accomplishments and overall evaluation of the Decade

A. Policy commitment

22. Unless the most senior government officials recognize and endorse the need for a commitment to mitigation practices, as an investment in protecting assets and conserving resources, disaster reduction will be assigned a low priority. History shows that without forethought, short-term crises of the day can easily overshadow the longer-term considerations and absorb resources needed to implement effective loss reduction measures. Organizations and government authorities alike must make a clear assignment of responsibilities, with the dedication of necessary resources, to implement mitigation.

23. Governments cannot sustain mitigation measures without broad public support. Many measures appear expensive, at least in the short term, or add costs to construction projects. In other cases, land owners will not readily accept a decision to develop land in a manner that yields less than the maximum short-term profit. In the face of these pressures, public understanding of hazards and an awareness of relative risks are essential to choosing government officials who will implement sound policies which can protect community assets and resources.

B. Hazard assessment

24. The causes of natural hazards are sufficiently well understood to provide a basis for undertaking actions to mitigate their effects. Nevertheless, research should continue to advance the understanding of natural hazards, including a measure of their effects on society, in order to improve estimates of threats and provide a sound basis for utilizing limited resources for mitigation and preparedness actions. The regions of the world that are prone to natural hazards are generally well delineated, and this knowledge provides the foundation for identifying the most threatened areas within countries. In some countries, the threat can be characterized with sufficient detail to enable the policy understanding and the mitigation of these hazards into land-use plans.

25. National and local public authorities, however, need to integrate hazard and vulnerability assessments more fully into their overall planning efforts. This requires that the risks associated with natural hazards be evaluated systematically and in concert with other factors influencing development decisions. Progress has been noted in this respect, as indicated by significant efforts in some countries and the increasing attention being given in international developmental discussions, such as those associated with El Niño or disaster rehabilitation efforts in Central America. Much greater attention to this fundamental basis for disaster prevention is required for the future, particularly within the context of countries' own planning initiatives.

C. Vulnerability and risk assessment

26. Natural hazards become disasters when they affect people and their socio-economic infrastructure to such an extent that the community or country cannot cope with the overall impact. The ability to deal with disasters varies considerably among different populations, with the poor having the fewest options and limited resources to cope or recover. They often occupy marginal or unstable lands or inhabit substandard structures. Despite their fundamental importance to the well-being of a society, hospitals and schools often suffer disproportionate damage from natural disasters.

27. The increasing concentration of population in large cities poses a degree of vulnerability that can threaten the economic viability of a country or region. These megacities serve as hubs and centres for transportation, communications, financial and commercial activity, as well as government. The severe impairment of their functions or

a disruption of increasingly complex but vital public utilities and physical infrastructure can bring a country to its knees. Small island developing States are threatened to a similar degree, but due to their physical isolation and limited economic base are often dependent on a single industry, such as tourism. Natural hazards can also threaten the cultural heritage of countries, and have destroyed irreplaceable works of art, historical locations and architecture.

28. Technical and procedural methods for estimating risk have improved substantially in recent years, and are becoming widely employed in the insurance and financial sectors for loss estimation. Advances should be pursued in this methodology, and the inventories of vulnerable structures and their exposure to various risks should be further developed. To address such a need, both technical experts and public policy authorities are working together to assess seismic risks and determine suitable mitigation strategies under the IDNDR secretariat-managed project on risk assessment tools for the diagnosis of urban areas against seismic disasters. There have also been a number of recently developed opportunities for advanced El Niño and regional climatic forecasts that can stimulate medium-termed vulnerability assessments. These are increasingly being accomplished and shared by multiple collaborating professional interests, especially in Eastern and Southern Africa and the Americas. As these examples demonstrate, risk assessments can be more widely utilized in regional and national development planning, drawing upon an increasingly wide range of professional abilities committed to shared policy objectives.

D. Risk reduction

29. Since substantial resources in most countries are linked to economic development, it is important that natural disaster mitigation become an integral part of the development process. Failure to adopt such a basic strategy as a foundation for disaster reduction can easily jeopardize economic development itself. The highest priority should be accorded to making this link, and many of the most productive measures that can be employed involve land-use planning, investment incentives and construction practices.

30. Economic development usually focuses on large projects or national financial policies involving substantial resources. Macroeconomic analyses can easily obscure the fact that many of the most vulnerable people have virtually no resources and exist outside the realm of developmental interests. Such people need low-cost methods to improve their housing, using materials or skills that are close at hand. Some IDNDR demonstration projects and other activities have proven methods using adobe or timber construction. Information needs to be distributed and training provided for people to benefit from these methods.

31. Hazard insurance provides a means for spreading risks, thereby facilitating investments in hazardous regions. Incentives can also be provided by insurance policies to reduce risks through applied mitigation practices, even as insurance payments following a disaster can stimulate recovery. In any of these cases, insurance premiums should be based on a realistic assessment of the risks, which must depend on hazard assessments. If premiums are set lower than is appropriate for a given risk, investment in effect becomes subsidized and a further liability is encouraged.

32. The direct cost of a natural disaster, measured only by damage to structures and injuries to people, is often dwarfed by the indirect and secondary costs. A large part of indirect costs is associated with the interruption or loss of business. In any natural disaster, many commercial establishments are forced to close and many never reopen, with attendant loss of employment. Spurred on by increasing competition and the demands of a global economy, businesses are now investing in preventive strategies to ensure their business continuity. In economic terms, the recognition of the value that "Prevention pays" has motivated businesses to pursue disaster reduction strategies as integral parts of their core business, and has led to some international cooperation and sharing of ideas in this important field. This is an initiative that should be encouraged, and through increased examples of public-private partnerships the benefits of the experience may become more widespread within the management and provision of more government and public services.

E. Communications and information

33. In order for any efforts at risk reduction to be successful, possible threats must be communicated through a chain of public authorities, as well as with the full comprehension of the public. The information provided can take a variety of forms, depending on the nature of the hazard and the time-frame involved. These various situations, ranging from an advanced hazard assessment of potential risk through an immediate alert of a clearly impending event each present different information and communication requirements.

34. Over the last decade, the availability of information about natural hazards and disasters has increased enormously. This has occurred through new studies of these phenomena, an explosive expansion of global channels of

communication, and perhaps most significantly through the widespread use of the Internet in most parts of the world. The use of global information systems has revolutionized opportunities for hazard mapping and risk assessment, even at quite localized levels. There have also been significant improvements in disseminating real or nearly real-time hazard information and warnings. More databases that contribute to the exchange and application of mitigation practices have become widely available and are globally accessible. New graphic information products and the availability of electronic information in more languages have also increased the possibilities for wider dissemination of hazard information. Efforts are needed to increase general and ready access to all of these modern channels of communication, especially the Internet. Challenges remain to improve the quality of the data, and to develop tools and operational standards for facilitating the compilation, synthesis and analysis of data.

35. The ability for individuals and computer systems to communicate has also been transformed in recent years, and even greater opportunities appear in the near future. The improvements in telephone, Internet, data systems and networks, their increasing availability, carrying capacity and speed of transmission, coupled with satellite-based transmission systems, are systematically changing and enhancing the way information is exchanged and shared. In addition, it is already possible to communicate between notebook-sized satellite telephones or computers anywhere. New orbiting satellite systems will shortly make it feasible to send and receive voice, data or Internet information with hand-held instruments. Today, and even more in the future, Governments and all organizations have a remarkable opportunity to enhance their communications capabilities, including those impervious to natural hazards.

36. The print and electronic media wield substantial power, and can greatly facilitate the understanding of hazards and the communication of disaster-related information to the public. Successful and even expanded use of the media for disaster reduction must, however, overcome several problems. Many providers of information about hazards and disaster conditions are technical experts, whereas many of the people involved in communicating the information are not. The comprehension of many people for whom information is intended frequently is determined by still other contexts or more localized perceptions. Additional issues concern how to present the message in an appealing and understandable manner. Presentation of information through the media deserves special attention by all organizations concerned with natural disasters, focused especially on the perceived suitability to address the needs of the intended users.

F. Early warning

37. As was emphasized at the IDNDR international conference on early warning systems (Potsdam, Germany, September 1998), effective early warning is a process that must bring together scientific analysis and technical forecasting of a hazard, together with the political decision-making process and the availability of local community capabilities to heed the warning. The declaration of the Potsdam early warning conference provides a summary of critical functional responsibilities, and it also serves as a call to action for all parties concerned to carry improved early warning practices into the twenty-first century.

38. The dissemination of information about early warning among service agencies or to the public must be given careful thought in each case. Such actions must be based upon well conceived and often technical systems for observation and analysis. Different forms of dissemination become necessary, involving different actors and various forms of communication that may be drawn from commercial interests, public media and governmental authorities. Most importantly, any warning must include a clear and informed statement of instruction or guidance sufficient to lead to effective action to avoid or minimize the consequences of the hazard. Governments themselves need to assess the adequacy of each of these stages of the warning process, and should give a high priority to establishing comprehensive, reliable and credible warning systems. These coordinated activities are crucial to reducing losses so that early warning becomes an essential element of any comprehensive disaster prevention strategy.

G. Education and training

39. During the Decade, significant progress has taken place with respect to education and training applicable to natural disaster reduction. This is reflected by a diversity of initiatives, ranging from practical community-based training to postgraduate education. In the course of IDNDR, there has been a significant increase in the community risk reduction and hazard awareness programmes for such threats as cyclones, hurricanes, tsunamis, earthquakes and wildfires. The diversity and imagination reflected in such local training initiatives provides evidence of the enormous creativity

within local authorities, national civil protection and disaster management agencies, as well as that located in youth groups, radio and television networks, NGOs and community-based organizations. It is also reflected increasingly by the development of locally or regionally created training and educational materials and learning packages, which are frequently more directly relevant to regionally specific risk profiles.

40. Similarly, there has been an upsurge in educational activities focused on natural risk and disaster reduction. From primary and secondary education through institutions of higher learning, more attention is being devoted to information about natural hazards and associated risks, as well as incorporating prevention and preparedness measures into existing educational programmes. Within primary schools, IDNDR's annual Natural Disaster Reduction Day has served as an important vehicle for making links between more conventional subject matter and disaster-specific themes. Topics like "Cities at risk" and "Water — too much — too little" have been well received in primary school curricula. Accompanying IDNDR information kits have been popular, enabling teachers to incorporate key disaster reduction concepts into classes and lesson plans.

H. Effectiveness of national committees

41. In General Assembly resolution 44/236, in which IDNDR was founded, Member States were asked to formulate national disaster mitigation programmes; establish national committees or focal points; mobilize support; increase public awareness; pay due attention to health care and related forms of essential social and economic infrastructure; and improve availability of emergency supplies. The formation of multisectoral national committees or focal points for disaster reduction were considered to be the best means for realizing these goals at the local level. In response to this recommendation, about 130 countries responded by identifying such an entity.

42. The effectiveness of national committees or focal points have varied from being highly effective to being parochial or inactive. Some have become a significant force for concentrating and mobilizing policy interests and professional applications in carefully conceived programmes in some countries. In others, more narrowly focused organizations have not adequately involved the wide range of participation that would have been preferred. The extent to which national committees or focal points concentrated on largely domestic aspects of disaster reduction, at the expense of broader regional or international interaction, also varied considerably. Where there were more limited accomplishments, they frequently resulted from the ways in which committees were first composed. Limitations included a failure to address sufficiently the breadth of interests of all potential stakeholders, not providing adequate resources or authority, or not being fully attentive to the original intentions of the Decade. In some few cases, the requirements of disaster prevention became too easily dominated by more traditional and limited concepts of emergency response, or they were cast in functional terms of planning for emergency disaster assistance frequently associated with established civil defence measures.

43. By contrast, there were noteworthy examples in which a contingent of highly motivated individuals drawn from a variety of professions dedicated much of their professional time and abilities to promoting a coherent programme of disaster mitigation, regardless of whether there was an officially constituted national committee or not. The success of this work often stemmed from a professional relationship or dedicated research interests, rather than from explicit institutionalized support. An important accomplishment of the Decade has been the opportunity it has provided for greater recognition of these singular initiatives. It has also aided institutions in appreciating that issues which contribute to disaster reduction often relate to their core interests.

I. Initiatives of city officials and at other local levels

44. Local authorities and municipalities have shown an increasing willingness to become involved with the Decade. This is a result of the recognition of disaster reduction as a central aspect to many local-level policies, including social vulnerability, urban risk management, land use planning, and in general the assessment of local community exposure to the consequences of severe natural phenomena. Furthermore, local officials are those most immediately involved with hazards, and have a direct responsibility in managing the risk of both natural and technological disasters. It should be noted that besides the involvement of local authorities through their international institutions and associations, a wide range of initiatives has been taken by municipalities and provinces in their own capacity, both in response to IDNDR awareness-raising campaigns and as the result of an increased understanding of the importance of disaster reduction in urban areas.

V. Major challenges for the twenty-first century

45. The extent of vulnerability within a society will determine its exposure to the impact of a hazard, and therefore the scale or magnitude of a potential disaster. Households and communities in developing countries are particularly vulnerable to natural hazards because of many interrelated factors, including large populations living in high-risk areas, frequently in conditions of poverty; livelihood insecurity; and environmental degradation. In many developing countries, infrastructure and crucial lifeline systems are particularly exposed to the effects of natural hazards. In industrialized countries too, with an increasing interdependency between information, complex technological facilities, human systems and hazards, there is now the potential for catastrophic failures on a global basis, as the example of the year 2000 computer problem has demonstrated. Equally, the relationship between human behaviour and biomedical risks has also become more evident, exacerbated by the ease of rapid international transmission of public health and environmental health hazards, including food contamination, as seen for instance in the dramatic spread of human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) throughout the world. Emphasis needs to be given by Governments, international development organizations, commercial interests and other sources of financial investment to ensure that all crucial systems which underpin modern societies are regularly assessed and remain disaster-resistant.

46. Overall vulnerability to disasters will certainly intensify unless there are significant improvements in access to essential social services and economic security, and unless sustained efforts are made to protect the crucial social and economic systems on which all societies depend. The reduction of vulnerability is an inherent part of sustainable development that must take account of the role of scientific and technical knowledge, ensure significant levels of popular participation and promote a full acceptance of careful environmental management.

47. Hence, the underlying challenge for the future is that the composite subjects of disaster prevention must become accepted as a public value and be explicitly embodied in official public policy responsibilities. Therefore, the major challenges for the twenty-first century described below can only be met fully with the exercise of authority and the distinct allocation of resources becoming accepted as integral elements of comprehensive national economic and development planning processes.

A. Integrated risk management and vulnerability reduction

48. Communities and development organizations can reduce potential natural disaster losses through a continuous programme of applied mitigation measures that are integrated into a comprehensive disaster prevention programme. Land-use planning and building standards are two of the major strategies for reducing vulnerability. Preparedness plans and warning systems are also essential elements. Mitigation can only be effective if it is a priority, integrated into an overall planning and development process with organizations and Governments, realized through networking strategies that enable and even encourage information exchange. Both multidisciplinary professional experience and intersectoral organizational relationships are essential if the strategy is to be both comprehensive and sustainable. It cannot succeed if it is regarded only as an additional consideration of disaster management, limited to singular event-based scenarios, or a derivative of emergency relief assistance focused only on the acute phase of hazardous events.

49. The reduction of potential losses depends on the commitment of both public and private leaders and organizations at all levels. It can only be sustained by an understanding embedded within the community based upon public awareness. This essential community support to practical activities also needs to be reinforced by a demonstrated expectation that the threat of natural hazards will be addressed. Consequently, the highest priority should be accorded to developing public awareness in order to bolster commitment to natural disaster mitigation at the highest levels of all organizations. Natural disaster mitigation must become widely accepted as an important public value within a community, and further recognized as an essential component of sustained economic growth.

B. Population concentrations and urban hazards

50. The global population is projected to rise to about 12 billion people by the middle of the twenty-first century, before levelling out. This growth will be accompanied by an even greater rate of increase in material goods and facilities to support this population. Thus, exposure to natural hazards

will steadily rise. Unless sustained actions are taken to reduce vulnerability and to increase mitigation practices, losses will continue to rise at an accelerating rate, as has become evident during the past 30 years.

51. Current trends indicate that this increasing world population is concentrating in urban areas, creating extraordinary demands on the physical environment and the facilities of modern life. Many of these resulting megacities have difficulty coping with day-to-day problems, and are poorly prepared to face the additional disruption and losses that a natural disaster brings. Concerted efforts are needed to address the vulnerabilities of megacities. Furthermore, as more population generally moves into coastal areas and other previously unsettled hazard-prone areas, the exposed risk to natural hazards is compounded in many countries. Countries — especially cities — need to evaluate the effect of these growth dynamics and address the trend in overall planning.

52. Megacities, expanding regional agglomerations and national systems depend on a complex infrastructure for their effective functioning. Roads, pipelines, power grids, telecommunications networks and similarly linked infrastructure systems are particularly vulnerable to natural hazards because a single break in the system can render the entire system useless. Barring specific capabilities for routing around disruptions, such as can be utilized in electrical grids, a failed system can also trigger numerous other cascading effects in other linked systems. Increasingly, communities will repeatedly be faced with massive failure of systems that they have come to depend on, further compounding their vulnerability. Redundancy or other provisions for contingent capacity must be addressed to a greater degree than has historically been associated with disaster management planning.

53. The potential for disasters caused by natural hazards on a scale not previously seen is a reality that Governments must confront. The earthquakes at Tangshan, China, in 1976, with 275,000 fatalities, and Kobe, Japan, in 1995, with losses in excess of $120 billion, are harbingers of the extraordinary loss and destruction that natural disasters can cause in a modern urban environment. Even greater losses are a real prospect as a sequence or combination of hazardous events, or the direct impact of an unusually severe hazard, such as hurricane Mitch demonstrated when it devastated several Central American countries and economies for years to come. Governments need to devote serious attention to the risks such events pose, and to begin to implement long-term sustained mitigation strategies to lessen their impacts.

C. Environmental and resource vulnerability

54. Much attention in the past has been focused on the threat that natural and human-induced hazards pose to people and structures. However, their threat to habitat and various ecosystems demands a similar priority, especially as ecosystems are often the basis for various forms of economic livelihood. The maintenance of productive fishing, agriculture, livestock-raising and forest product utilization is dependent on minimizing all forms of ecosystem degradation.

55. The recent global experience of the 1997–1999 El Niño/La Niña phenomenon graphically illustrates how natural hazards and related human behaviour can substantially impact the environment, habitat and essential resources of land, forest, water and even air quality. The extensive and persistent effects of floods and drought around the world come immediately to mind, but landslides, wildfires with the associated smoke and haze, and other hazards, such as severe and adverse temperature variation, are important in this respect as well.

56. Natural, human-induced and technological hazards pose a real and growing threat of long-term or permanent damage to the environment, ecosystems and biodiversity, on which all societies depend. With widespread global economic practices, vulnerability can easily increase because of linkages between human-induced and natural hazards that can multiply and magnify each other's consequences. Deforestation and improper land use practices can lead to increased run-off during rains. This may in turn lead to floods of greater severity, creating additional risks to industrial sites, further threatening chemical pollution of a habitat.

57. Realistic risk assessments in the future must take account of the growing potential for the combined effects of hazards, derived from both natural and human-induced circumstances, and their respective cascading effects. More attention must be given to their combined social and economic consequences inherent in increasingly complex societies, as well as to the more fundamental and long-term perspective of environmental and resource vulnerability.

D. Disaster prevention capabilities of developing countries

58. Advancing the practice of disaster prevention depends on recognizing the threat posed by natural hazards, evaluating options for addressing the threat, and assigning

a priority for implementing appropriate measures. Experience shows that progress in this endeavour depends on a continuing dialogue between authoritative decision makers in each risk-prone country or region and experts on the various aspects of hazard assessment and risk management. Therefore, every vulnerable country needs a national or regional capability for disaster prevention and mitigation, necessarily linked to contingent preparedness, response and recovery systems for use when the hazard exceeds prevention capabilities.

59. It is equally important to recognize that foreign consultants cannot usually meet this need on a continuous basis because they are not able to articulate the issues and advocate appropriate actions as part of the national decision-making process. Therefore, a priority should be accorded to assisting developing countries in establishing these capabilities.

E. Coordination and implementation

60. By undertaking the International Decade for Natural Disaster Reduction, the Member States of the United Nations cast a spotlight on the increasing threat to modern societies of natural hazards. The Decade has provided a global opportunity to increase public awareness, motivate official and professional bodies, engage scientists and technical interests, and stimulate commercial endeavours in the promotion of new programmes. This focus provided by the United Nations has, together with a series of some of the most costly and devastating natural disasters during the decade, succeeded in raising the recognition and the feasibility of natural disaster reduction. Steadily increasing attention is being given to the matter by many international, regional and national organizations. As the end of the Decade approaches, the need for future responsibility and leadership in this area must be addressed.

61. As noted before, it is absolutely essential that all Governments and organizations concerned with economic development adopt natural disaster mitigation as an inherent value in their operations. Beyond this basic approach, there will be a continuing need for coordination among practitioners of mitigation at the regional and international levels. Furthermore, NGOs play an essential and highly effective role in regional and international coordination. The efforts of NGOs should be effectively linked with corresponding efforts by government entities and the private sector. The critical question is how such coordination can best be provided.

62. The United Nations took an important initiative in launching IDNDR, and some organizations within the United Nations system devoted substantial effort to furthering the goals of the Decade. Although such attention was at times overshadowed by other crises, such as large migrations of populations during complex emergencies, the United Nations maintained a sustaining vigilance on IDNDR. The programme areas of greatest priority and for which lead organizations in the United Nations system should be designated are (a) advancing the frontiers of science and education; (b) implementing scientific and technical programmes to monitor hazards phenomena; (c) promoting and implementing mitigation as an integral part of any economic development; and (d) implementing preventive measures to promote public health.

VI. Concluding observations

63. In launching IDNDR, the United Nations focused attention on the importance of mitigation in reducing losses from natural hazards and disaster prevention, and most importantly on how to ensure increased access to these abilities and resources throughout the world. Modern means of telecommunications and technological advances in global information exchange, networks and linking organizations provide resources unimaginable even 10 years ago. Numerous organizations have seized these opportunities, bolstered by a series of disasters during the decade that have vividly demonstrated the unacceptable costs of growing threats faced by modern societies.

64. Mitigation and prevention practices are now achieving a priority approaching that previously reserved for contingent emergency management activities associated with relief and recovery during the acute phase of individual disasters. Astonishing advances in communications, a greater utility in earth observation, the scientific understanding of hazards, and a much greater public awareness and acceptance of the feasibility of disaster reduction activities have all combined to demonstrate the effectiveness of timely early warning capabilities. Early warning is now recognized as an essential element of any comprehensive disaster prevention strategy. These concepts are now effectively being applied, aided by a much increased exchange of global experience spanning many different areas of professional endeavour.

65. The stage is now set, as all countries of the world move beyond IDNDR, for increased implementation of loss reduction methodologies and for achieving the goal of disaster-resistant communities. There is an unavoidable

responsibility to carry on the momentum to promote hazard awareness and the application of risk management practices for disaster reduction that national committees and other bodies of the International Framework have initiated. The need is a universal one that is relevant for all countries, but the components of sustained and successful disaster prevention are multiple. To accomplish them, policy and institutional perspectives are required among Member States and within individual countries that can demonstrate and even encourage or mandate multidisciplinary and intersectoral collaboration.

66. As the Decade comes to a close, there is also a crucial need within the United Nations system to place a distinct coordination function at a sufficiently authoritative level to assure inter-agency oversight of the planning, implementation and institutional synergies in natural disaster reduction. Various options have been suggested, including the establishment of an intergovernmental panel or a commission. Whichever form is chosen, in recognition of the inherent cross-cutting nature of the subject of disaster prevention, the decision must bring together all of the relevant parties. While individual implementation responsibilities should properly be exercised among designated agencies, matters of advocacy, coherent policy development and organizational coordination must rest in a collective inter-agency authority.

67. Disaster prevention for the future, with a full appreciation of the economic and social consequences of risks and society in the future, must involve issues and abilities of sustainable development, environmental management, science and technology, commerce and industry, and the encouragement of participatory forms of governance that contribute to social well-being and security. It can reflect no single professional culture because the natural hazards and risks to societies in the coming age will challenge and call upon collective abilities. This matter becomes even more pressing when it is recognized that more hazards of the future will be international in nature, with transnational demands on various forms of government polity.

68. As an ongoing matter of global concern that deals with major cross-cutting aspects of development, disaster prevention needs to be linked to all the relevant conclusions of the key United Nations conferences of the 1990s in order to implement strategies for reducing disaster losses in a coordinated, sustained approach for a safer twenty-first century. Ultimately, this cannot succeed unless and until there is a demonstrated political willingness to transform the available and emerging wisdom and demonstrated practical experience into accepted policy and resource commitments.

Notes

[1] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3–14 June 1992*, vol. I, *Resolutions Adopted by the Conference*, resolution 1, annex II.

[2] Ibid., annex I.

[3] *Report of the Global Conference on the Sustainable Development of Small Island Developing States, Bridgetown, Barbados, 25 April–6 May 1994* (United Nations publication, Sales No. E.94.I.18 and corrigendum).

[4] See "Topics", in Munich Reinsurance annual report for 1998, and Munich Reinsurance press announcement of 28 December 1998.

Annex I

List of Scientific and Technical Committee members

William John Richard **Alexander**, South Africa (1996–1999)
Alexandra **Amoaka-Mensah**, Ghana (1990–1997)
Peter S. **Anderson**, Canada (1996–1999)
Anand S. **Arya**, India (1990–1997)
Franco **Barberi**, Italy (1990–1993)
Mohamed **Belazougui**, Algeria (1996–1999)
Mohammed **Benblidia**, Algeria (1990–1996)
Driss **Ben Sari**, Morocco (1990–1996)
G. Arthur **Brown**, Jamaica (1990–1993)
James P. **Bruce**, Canada (1990–1996)
Claudia **Candanedo**, Panama (1990–1996)
Barbara E. **Carby**, Jamaica (1993–1999)
Umberto **Cordani**, Brazil (1990–1996)
Mustafa **Erdik**, Turkey (1996–1999)
Alberto **Giesecke**, Peru (1990–1998)
Robert M. **Hamilton**, United States (1996–1999)
Youri A. **Izrael**, Russian Federation (1990–1993)
Ailsa, **Holloway**, Zimbabwe and South Africa (1993–1999)
R. P. **Karimanzira**, Zimbabwe (1996–1999)
Vit **Karnik**, Czechoslovakia (1990–1993)
Elizabeth **Kassaye**, Ethiopia (1990–1993)
Tsuneo **Katayama**, Japan (1996–1999)
Senipsi Langi **Kavaliku**, Tonga (1996–1999)
Vaino **Kelha**, Finland (1990–1996)
Takeo **Kinosita**, Japan (1990–1993)
Roman L. **Kintanar**, Philippines (1990–1996)
Michel **Lechat**, Belgium (1990–1996)
C. J. **Littleton**, Australia (1993–1999)
Liu Yanhua, China (1996–1999)
Giuseppe **Luongo**, Italy (1993–1999)
A. Ch. **Maskrey**, Peru (1996–1999)
Philippe **Masure**, France (1990–1996)
Alberto **Maturana** Palacios, Chile (1996–1999)
Ahmed Ibrahim **Naguib**, Egypt (1996–1999)
Bhuvarahan **Narasimhan**, India (1996–1999)
Isaac **Nyambok**, Kenya (1996–1999)
Thomas **Odhiambo**, Kenya (1990–1993)
Dallas **Peck**, United States (1990–1996)
Manuel **Perlo** Cohen, Mexico (1996–1999)
Erich **Plate**, Germany (1990–1996)
Aura Elena **Rodriquez** Marrero, Colombia (1990–1993)
Marilo **Ruiz** de Elvira, Spain (1990–1993)
Hermann **Schmitz-Wenzel**, Germany (1996–1999)
Eugene **Staffa**, Canada (1996–1999)
Atsushi **Takeda**, Japan (1993–1996)
Albert **Tevoedjre**, Benin (1993–1999)
Yuri **Vorobiev**, Russian Federation (1993–1999)
J. J. **Wagner**, Switzerland (1993–1999)
Xie Li-Li, China (1993–1996)

Annex II

Summary of Scientific and Technical Committee meetings 1990–1999

First meeting (Bonn, 4–8 March 1991)

Established targets for the Decade to complete national risk assessments and preparedness plans, and establish access to warning systems by the year 2000; adopted criteria for approval of demonstration projects; reviewed links to other related United Nations programmes on climate change, environment and development, and response to emergencies.

Second meeting (Guatemala City, 16–20 September 1991)

Reviewed disasters at Mount Pinatubo in the Philippines, Mount Unzen in Japan, and floods in China; adopted demonstration projects related to tropical cyclones, volcano hazards, earthquake hazards, information systems, education/research/training, risk assessment/preventive actions, public health, international centres, and megacities; and reviewed and endorsed plans for the World Conference on Natural Disaster Reduction.

Third meeting (Geneva, 16–20 March 1992)

Identified actions to be taken at the national level and established guidelines; adopted international demonstration projects proposed by the Department of Humanitarian Affairs/UNDRO, Habitat, UNDP, UNDP/UNV, WHO/PAHO, UNESCO, WMO, ICSU, WFEO/UATI, and IASPEI; analysed proposed studies on the economic benefits of disaster mitigation actions; adopted an information strategy; reviewed plans for the World Conference on Natural Disaster Reduction.

Fourth meeting (New Delhi, 1–5 February 1993)

Assessed progress with national committees and focal points; reviewed national programmes of Bangladesh, India, the Philippines and Vanuatu; heard a report on management of drought in India and earthquake in Jamaica; reviewed progress in demonstration projects and plans for an information strategy and the World Conference.

Fifth meeting (Geneva, 22–24 November 1993)

Completed plans for the World Conference, including guidelines for regional reports and public/private sector interface, and recommendations for the technical committee, poster and exhibit sessions; continued review of demonstration projects; prepared for mid-term review of the Decade by the General Assembly.

Sixth meeting (Washington, D.C., 27 February–3 March 1995)

Reviewed national, regional, and global disaster reduction strategies; analysed early warning and information systems; heard report on Kobe, Japan, earthquake; discussed the outcome of the World Conference and plans for the second half of the Decade.

Seventh meeting (Moscow, 11–14 March 1996)

Heard reports on a typhoon in the Philippines, lahars at Mount Pinatubo and reconstruction at Kobe, Japan; prepared recommendations on training for disaster reduction; reviewed and evaluated demonstration projects; issued the Moscow statement, which called on the United Nations Secretary-General and the executive heads of the specialized agencies to strengthen capacity-building of countries and communities at risk for vulnerability reduction and emergency preparedness as an activity distinct from humanitarian assistance, and include these functions within the development-oriented components of the United Nations and its specialized agencies.

Eighth meeting (Paris, 20–23 January 1997)

Reviewed plans for final evaluation process of the Decade; discussed transition process beyond the year 2000; conferred with United Nations agencies' representatives on plans beyond the Decade; reviewed activities of the French national committee of the IDNDR.

Ninth meeting (Geneva, 13–17 October 1997)

Reviewed the impact of disasters: volcanic eruption at Montserrat, earthquake in Italy, hurricane in Mexico, El Niño in Peru and South Africa, and earthquake in India; heard plans for new projects on early warning, earthquake risk assessment and flood investigation in northern Europe; developed plans for the closing process of the Decade, including recommendations for a high-level segment on the Decade at the substantive meeting of 1999 of the Council associated with a programme forum.

Tenth meeting (Washington, D.C., 8–12 June 1998)

Prepared an outline and plans for the final report on the Decade by the Scientific and Technical Committee; reviewed efforts to integrate natural disaster mitigation into sustainable development; reviewed the effects of El Niño in Ecuador and other countries.

Eleventh meeting (Canberra, 15–19 February 1999)

Reviewed the draft final report of the Committee on IDNDR; prepared the report for the substantive session of 1999 of the Council; reviewed plans for the programme forum; received a briefing on activities of the Australian national committee.